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ON THE "HEPATIC" PLUMAGE OF THE CUCKOO.

By Frederick Coburn.

On May 4th and 17th, 1895, I received two specimens of *Cuculus canorus* in the "hepatic," or liver-coloured, phase of plumage.

The first was shot by Mr. F. C. Clare in his garden, and the bird was so curious in appearance that Mr. Clare did not know that he was shooting a Cuckoo.

The second specimen Mr. Clare found on May 17th on his garden-path, and, to use his own words, "it appeared dazed, and allowed itself to be picked up." A *post-mortem* disclosed a bruise on the skull, which might have been caused either by a stone thrown at the bird, or by its having accidentally come in contact with a post or bough of a tree while endeavouring to elude the pursuit of the male. This would account for its dazed and helpless condition.

On dissection both birds proved to be females, with well-developed ovaries. These birds are in that most interesting state of plumage, the change between the "hepatic" and the adult, and a careful examination of them, also of males and females in the nestling plumage (August 6th, 1895), will enable me, I think, to clear up the mystery which Mr. Harting, in his excellent article (p. 257), seems to think surrounds this hepatic stage of plumage.

Selby was quite right in remarking that "the young females have more of the reddish brown disposed over their plumage," &c.; for all young males I have dissected are much darker in colour than females: in some specimens they have quite a blackish appearance about the head, neck, and dorsal region, while the females have always had a lighter and redder general appearance.

But young Cuckoos vary considerably. In one male I have there is a large white patch on the forehead, and another on the nape, while in the darkest example of a young male in my collection there is no trace of white on any part of the head.

All the authorities quoted by Mr. Harting are wrong in supposing that the change from the nestling to the hepatic plumage, or from the hepatic to the adult plumage, is the result of a moult.

I do not think that any moult takes place even between the autumn condition of the young bird and the full grey plumage of, say, June.

It is probable that fuller investigation will prove that the adult Cuckoo moults once only in the year, and that after its breeding operations are ended, and probably after it leaves this country. On this point I received lately some curious and interesting information from a friend, Mr. Charles Lunn, to the effect that last year he reared a young Cuckoo, and has it still living. It is very tame, knows its master, and has become omnivorous in its diet, preferring cooked vegetables to meat. It remained in its nestling plumage throughout the winter; and up to past the middle of July there was no sign of any attempt to moult on the part of the bird, but suddenly the feathers began to fall out, and the bird soon became absolutely naked. It did not appear to suffer in health or spirits, but the new feathers began to appear before the end of the month, and according to Mr. Lunn, "they grew with marvellous rapidity."

My conversation with Mr. Lunn took place before I had read Mr. Harting's article, otherwise I might have put several questions to him bearing on the subject, which must now be deferred until I receive another visit from him, for I have not his present address.

There are many birds which do not moult so frequently in the year as we have been led to suppose, and a change of colour in the feather does not always mean a moult. Neither is it always the result of the wearing off of the tips of the feathers, as suggested by some.* But it is caused by the gradual fading away

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* I do not agree with the conclusions of Herr Meves, and shall, I think, when the proper time arrives, be able to completely upset this widely accepted theory,—of the wearing off of the tips of the feathers.

BRITISH MUSEUM

of the colouring matter of the feather, or, on the return season, a gradual development of the same colouring matter in the old feather.

This is, I know, a subject of great importance, and one which is not yet understood by ornithologists; but I have been patiently working at it for some years, and have collected such a mass of information as to leave no doubt in my mind that my theory is correct, for I can show feathers in all stages of fading and acquiring the colouring matter, and also showing two distinct and widely different states of plumage on one feather.

So far as my experience goes, the chief moulting period for wild birds is in the autumn, after the breeding season. Spring moults are comparatively rare, and when they do occur are generally only partial.

This is obviously a subject which I cannot fully deal with in this article. Suffice it to say that the two Cuckoos under notice fully confirm my previous investigations. They show at a glance both the hepatic and the adult stage, and show also that the cinnamon or reddish colour is slowly fading away and giving place to the grey stage, *without moulting*. In the bird most advanced towards the grey plumage there is not a trace of moulting, while in the other there is one solitary rectrix moulting, but I think it highly probable that this was to replace one accidentally lost, for the new rectrix is of the hepatic and not the grey type.

Mr. Harting (pp. 257, 258) has minutely described his bird which was shot in April, and it will be seen that the whole of the upper parts displayed the reddish tinge of colour.

My first bird, shot on May 4th, shows on the crown of the head the grey of the adult, but the feathers very faintly barred in the middle with sandy brown, almost imperceptible until they are divided. The sides of the head, the lores, chin, and throat are a greyish white, suffused with pale brown and very faintly barred. The whole of the neck, upper back, and breast are of a cinnamon or light liver-colour, barred with blackish. The primaries and secondaries are a faded brown, spotted and barred on the outer and inner webs with reddish; some of the tertiaries are distinctly brown. The scapulars and all the wing-coverts are grey, with very distinct brown spots. The back and rump is grey, as in the adult, but with a trace of brown spots here and there. The upper tail-coverts distinctly reddish, and the tail just as in Mr. Harting's specimen. The under tail-coverts are cream-white; only the longest of them are spotted and streaked with black. The whole of the under parts from breast to vent white barred with blackish, but not so distinct as in the grey bird. Irides brownish yellow; bill horn-brown, paler at the base; gape, legs, and toes pale orange-yellow.

My second bird, procured on May 17th, has the whole of the head, chin, and throat grey, as in the adult; the neck and breast reddish, barred with blackish, but much fainter than in the first bird. The wings are a greyish brown, with the faintest trace only of reddish spots. The scapulars are grey, with only a tinge of brown; the back and rump is that of an adult bird, and the tail has lost nearly all the hepatic colour and almost resembles that of the adult. The under parts are white, more distinctly barred with black than in the first example, and almost as boldly as in the adult grey bird. The under tail-coverts are creamy white, all of them spotted and barred with black. The irides more distinctly yellow. Bill blackish horn, paler on the edges; gape bright orange; tarsi and toes dull yellow.

Here, then, we have the gradual fading away of the hepatic plumage as in Mr. Harting's distinctly red bird shot in April, to one almost grey obtained on May 17th, and I have no doubt that by the first week in June all trace of the red stage would have vanished.

A full-fledged female nestling Cuckoo shot on Aug. 6th, 1895, measures 12¼ in., one of those shot in May measures 12¾ in., so that there is practically no increased growth between the young birds of August and what we may call the adult of May, for both adults and young which I have measured vary to the extent of half an inch.

This immature female bird and the specimen procured on May 4th, when compared, show all the markings in common, and it is easy to see how the darker red of the young bird might gradually fade away and leave the light red of the hepatic stage. Then compare the second bird with the first and with one in full grey plumage, and the gradual fading away of the hepatic stage is unmistakably manifest.

The rarity of Cuckoos in the hepatic condition of plumage in England,—and I have no doubt as to their infrequency, for throughout my long experience of some thirty years these are the first two I have met with in the red dress, although I have occasionally had examples with a feather here and there which had not changed colour,—may be accounted for by the fact that the change of colour in the feathers takes place, as a rule, *before* the birds come to us in spring, and this will also explain their comparative abundance on the Continent.

In a normally healthy bird the change of colour would take place rapidly. The specimens in the red condition of plumage which we get in this country are simply examples of retarded development. The cause of this failure on the part of the bird to change the colour of its feathers at the proper time is known to me, but for the present I reserve information on this point.

It must be remembered that all red Cuckoos met with either in England or abroad have been in the months of April or May. We have no record of one found in June. What, then, becomes of the hepatic Cuckoos after April or May? The only answer, I think, to this question is the theory I have above suggested.

I do not think that Mr. Seebohm is right in asserting that "the female Cuckoos just entering their second year do not breed." From the examination of the ovaries in my two birds, I should unhesitatingly say that they were breeding females. And I cannot refrain from directing attention to the singular fact that all the red Cuckoos whose sex has been ascertained have proved to be females, with the exception of those mentioned by Temminck.

Mr. Harting states that the female examined by him showed no marked development of the ovaries. If the bird was shot early in April, no marked development could be expected in a young bird; but every week—nay, every day—would add to the development of these organs at the breeding period.

To briefly summarise, then, it seems to me that (1) *Cuculus canorus* in the red or hepatic phase of plumage is the young bird of the ensuing spring; (2) that it does not moult until it is over twelve months old; and (3) that it is a gradual change of colour in the feather which transforms it from the reddish nestling stage to that of the adult grey bird.

IN QUEST OF BIRDS ON THE MUONIO RIVER.

By A. Sutton Davies.

The River Muonio, as most ornithologists are aware, forms the natural frontier between Swedish and Russian territory where those two countries adjoin one another, or, more strictly speaking, between Swedish Lapland and Russian Finland. Taking its rise from Lake Kilpis-järvi in Finland, close to the Norwegian frontier, and not more than thirty miles from the Lyngen Fjord in Norway, the river flows in a southerly direction to the Gulf of Bothnia, more than three hundred miles away. The country being low, with no mountains of any size, there are long stretches of still, unbroken water on the river; but on the other hand, there are several places where the rapids extend almost without a break for six miles. The banks are low, and densely fringed with willow-scrub and stunted birch-trees; while great stretches of "tundra," the breeding-places of countless birds, stretch on either side up to the rounded hills which form the river valley. This district has been rendered famous in the annals of ornithology by the late John Wolley, who, making his headquarters some forty years ago at Muonioniska, a little south of lat. 68° N., worked the country round for several years. The upper parts of the river, however, have been but little explored, Wolley himself having only passed through them once on his way from Norway to Muonioniska: and it was with the object of fishing and observing birds on the upper Muonio that we left England on the 18th June last.

So many ornithologists have travelled up the Norwegian coast that the features of its bird-life are now tolerably familiar. As we went northwards Gulls, Oyster-catchers, Terns, Richardson's Skuas, and Guillemots (*Uria troile* and *U. grylle*) became more and more frequent. At Tromsö, where we had to spend several hours on June 25th, we found young Fieldfares and Bramblings just leaving the nest in the birch-woods. The night of June 25th–26th was spent on the island of Sjaervö, lat. 70° 3′ N., where by the light of the midnight sun we visited a colony of Herring Gulls situated upon the top of a hill above the sea. Although there was an inaccessible cliff close by, with plenty of nesting room, the Gulls apparently preferred the flat ground at the top, which was covered with nests. Most of the eggs were somewhat incubated. On our way down from this colony we disturbed a hen "Ryper" (*Lagopus albus*) from her nest under a rock. The nest, which was artfully concealed by a curtain of trailing plants which hung down from the rock above, contained ten incubated eggs, very much like those of our Red Grouse, but slightly smaller. On a pebbly beach at the foot of the hill we found a nest of the Oyster-catcher (*Hæmatopus ostralegus*) containing two eggs.

Skibotten, our destination on the Lyngen Fjord, was reached on the evening of June 26th, and we at once began our march towards the frontier, following the little Salmon River which falls into the fjord here. Yellow-hammers and Blackcaps were both seen and heard joining with the Redwings, Bramblings, and Mealy Redpolls in the general bird-chorus which began at 1 a.m. Higher up the valley we fell in with Blue-headed Yellow Wagtails, Bluethroats, and Rough-legged Buzzards; also with mosquitoes, that did not cease to remind us of their presence until we returned to Skibotten twenty-eight days later.

At Helligskoven, a little mountain hut occupied by a Finn with a Lapp wife, we rested for twenty-four hours. Here we found a nest of the Blue-headed Yellow Wagtail in a hole at the foot of a birch, with well-fledged young. There was also an addled egg, which resembled almost exactly the egg of the Yellow Wagtail. On comparing it with specimens of the latter at home it was impossible to distinguish between them. Here we saw and shot a specimen of the Northern Black-bellied Dipper: we did not see a single bird of this species after crossing the frontier. We crossed into Russian Finland on June 28th, and rested in an unoccupied shelter on the shores of Kilpis-järvi, the lake from which the Muonio takes its rise. In the willow-scrub near the house Bluethroats, Lapland Buntings, and Red-throated Pipits were very numerous; we found a nest of the latter in the side of a grass tussock, containing four incubated eggs.

As it would be an endless task to enumerate the birds seen each day, it will be more convenient to give a general summary of the observations made during the month spent between Finland and Sweden; a river separating the two countries, we were constantly passing to and fro, and it is therefore unnecessary to make any more marked distinction between them.

Of Thrushes we observed only the Fieldfare (*Turdus pilaris*) and the Redwing (*T. ilacus*). The Fieldfare all the way down to Kaaresuando was very uncommon. Fir-trees do not occur higher than lat. 68° 30′ on this river, and it was not till we reached the fir-woods that we saw a single bird of this species. We only found one colony, and the natives all agree that upon the upper Muonio the Redwing, whose song is to be heard everywhere, is far the commoner of the two.

We did not find many Wheatears, and never saw a Whinchat.

The Redstart is fairly common, and is known to the natives by a name signifying "poor, or worthless, sort of a Bluethroat." It generally builds in deserted holes of the Lesser Spotted Woodpecker.

The Willow Wren was the only species of warbler observed, and this was very abundant. The Finns, who are nearly always keen observers, could not tell me of any other species of warbler.

The Bluethroat (*Cyanecula suecica*) was very abundant in the willow-scrub; its song continued all night, even when all other birds were silent—*i. e.*, from 11 p.m. to 1 a.m. This bird has marvellous powers of imitation, and the long continuous strain, consisting of the songs and notes of other birds connected by little passages of warbling, reminded us greatly of the Sedge Warbler.

Of Tits, the Northern Marsh Tit (*Parvus borealis*) and the Lapp Tit (*P. cinctus*) were the only species observed, and these were very uncommon, being seen only in the fir-growth.

Around every house were one or two broods of White Wagtails; but as there are only a dozen houses between the frontier and Kaaresuando, a distance of seventy miles, they can only be called proportionately plentiful. Blue-headed Yellow Wagtails swarmed along the sides of the river, and in the marshier parts of the "Uoma" or tundra-like moors.

We found the Meadow Pipit (*Anthus pratensis*) in several places; but the predominating species was always the Red-throated Pipit (*A. cervinus*), one of the characteristic birds of the Uoma. We discovered three nests: those found on June 28th and 29th contained incubated eggs; but one found at Keinovuopio on July 27th contained five fresh eggs. We did not observe the Tree Pipit (*A. trivialis*) or the Pied Flycatcher (*Muscicapa atricapilla*); the latter species was not recognised by any of the Finns when I showed them my note-book in which I had made drawings of all species which I thought likely to be met with.

House Martins abounded in the neighbourhood of dwellings. The Finns encourage them by placing laths under the eaves to support the nests; and we counted as many as seventy nests on a single hut. In some places they were building in nest-boxes of birch-bark. We met with the Sand Martin at Kaaresuando, where it was building in the low sandy banks of the river.

The Shore Lark (*Alauda alpestris*) occurs on the higher ground towards Kautokeino in Norway, as does the Snow Bunting; the magistrate at Kaaresuando had stuffed specimens, but we did not observe any *en route*. The Lapland Bunting was one of the commonest birds on the Uoma; they frequented the more open parts as well as the willow-scrub, and the males in their glorious plumage might be seen everywhere perched on a hillock, and uttering their melancholy call-note, which resembles faintly that of the Golden Plover. Several Reed Buntings were observed, but no Yellow-hammers after crossing the border.

Bramblings (*Fringilla montifringilla*) were extremely common, and we found many nests, but most of the eggs were still fresh at the end of June. Though heard all day long, the birds are very shy, and seldom seen. The nest resembles that of the Linnet. To compare it to that of the Chaffinch does not seem quite accurate, for it never has the covering of lichen which is so characteristic of the Chaffinch's nest. We found the lining to consist invariably of an outer wall of white feathers (generally those of the Willow Grouse), with an inner layer of white willow-down. The nests were generally placed in the fork of a birch. The eggs we found resembled those of the Linnet rather than those of the Chaffinch, and were small for the size of the bird.

The Mealy Redpoll (*Linota linaria*) was very abundant, both in the birch-woods and in the willow-scrub; but by the time we arrived, the young birds were flying about with their parents in the trees.

In spite of the statement made in 'Yarrell' to the effect that the House Sparrow (*Passer domesticus*) has been observed at Kaaresuando, we searched most carefully all the time we were there, and failed to see one. As there are only twelve houses in the village, we should hardly have failed to see this bird. The natives said they had no birds round the house but White Wagtails and Martins, and, in the winter, Snow Buntings.

We did not see any Pine Grosbeaks (*Pinicola enucleator*), but a Finn who when a boy used to collect for Wolley told us that he had taken a nest of this bird this year.

The Magpie (*Pica rustica*) has not at present come further up the valley than Kaaresuando (lat. 68° 26′ N.), where a single brood was hatched out this year. We saw Hooded Crows a little further north, and Ravens all the way up the valley; but the two latter species are said to increase in numbers in "Lemming years."

We saw but one Woodpecker (*Dendrocopus minor*); the fir-growth is probably too sparse to encourage them so far north,—the northern limit of several species seems to lie between Muonioniska and Kaaresuando. The woodwork of the church in the latter village was bored with woodpeckers' holes.

The Cuckoo (*Cuculus canorus*) was heard on all sides.

Probably from the scarcity of thick woods, we did not come across a single Owl. We saw stuffed specimens of the Hawk Owl and Tengmalm's Owl, which with the Lapp Owl are said to be fairly numerous a few miles below Kaaresuando. In "Lemming years" the Snowy Owl, the Eagle Owl, and the Short-eared Owl are numerous on the higher grounds, but the Finns had not seen any Lemmings this summer, and consequently Owls and Hawks have been very scarce. We saw one Merlin, and a few Kestrels. A Finn who collects eggs at Kaaresuando had several clutches of eggs of the Goshawk, Peregrine, Rough-legged Buzzard, and of *Falco gyrfalco*. The Falcons, however, do not breed in any numbers, being found more frequently in the mountainous country round Kautokeino, in the Norwegian province of Finmarken. We saw a Peregrine working over the Uoma on July 4th, but apparently was not nesting. Goshawks are said to be fairly plentiful where there are trees large enough for building purposes.

We saw a good many Rough-legged Buzzards (*Buteo lagopus*) on the upper part of the river, especially close to Kilpis-järvi. On July 21st, while rowing across a small lake some five miles below Kilpis-järvi, we heard a sharp whistle from the cliffs above, which our Finns told us was the cry of a young Rough-legged Buzzard. We accordingly landed, and after a climb of half-an-hour reached the nest, which was built on a sheltered ledge above a great slope of boulders. Ten feet above it was the nest of the previous year, a substantial structure of twigs, some four feet in diameter; but the nest occupied was little more than a hollow scraped in the soil with a number of sticks scattered uselessly around. It contained one full-grown young one, with a good deal of downy fluff adhering to the feathers, and unable to fly, a young one which had been dead some time, the remains of an Arctic Hare, and a Blue-headed Yellow Wagtail. One of the parent birds kept circling high above us while we examined the nest, uttering her mewing cry, which was answered by the sharper whistle of the young bird. This bird, which I now have at home in Surrey, escaped, but returned after two days, when I succeeded in whistling it down to alight on my hand.

The Great Grey Shrike occurs, but we only observed it once, and the Swift is said to occur on migration only, and then but rarely.

Both the Golden and White-tailed Eagles and the Osprey are said to have greatly decreased in numbers of late, but the former are of course more plentiful in "Lemming years."

We came upon a brood of Lesser White-fronted Geese on July 2nd in travelling down the rapids. The goslings were very tame, pecking at the mosquitoes on our hands. The old birds flew round and round in great excitement, uttering a harsh croaking. The Bean Goose (called by the Finns "Mountain Goose") occurs on the higher ground, as does also the Whooper (*Cygnus ferus*).

The Mallard is very rare, and we only saw one pair on June 30th.

The Shoveler (*Spatula clypeata*) is sometimes seen on migration.

The Pintail (*Dafila acuta*) is fairly common, and we caught some full-grown young ones on July 12th, easily distinguished by their long, graceful necks.

The Wigeon is one of the most abundant of ducks. It is an early breeder, and we began to see flights towards the end of our time. The Teal (*Querqedula crecca*) is nearly as common. We were surprised to find the Tufted Duck (*Fuligula cristata*) as common as it was; we saw quite a number of broods, and obtained a clutch of eggs from Kittainen. Below Kaaresuando the Scaup (*F. marila*) was fairly common, preferring small lakes with rocky shores to the river swamps. The flappers of this species may be distinguished by the broad bill with well-developed white nail, the yellow irides, and the greenish legs with black toes. The down plumage is much like that of a gosling.

Goldeneyes were very plentiful, especially lower down the river, where the Finns have put up numerous nesting-boxes for them to lay in.

We found the Long-tailed Duck (*Harelda glacialis*) fairly numerous about Keinovuopio, some fifteen miles below Kilpisjärvi, and here we obtained a nest with seven eggs on July 1st. This was built in the reeds on the edge of a swampy pool, and was almost immersed in the water. The bottom of the nest, which resembled that of a Moorhen, was soaked, and there were only two down-tufts, of a dark-brown colour. We identified the female bird swimming near at hand. The eggs are small, and of a dark greyish-green.

The Common Scoter (*Œdemia nigra*) was abundant, and we obtained two clutches of their eggs, which are of a beautiful creamy-yellow tint. The Finns also recognised the Velvet Scoter (*Œ. fusca*), which we did not see. Last year I found this species almost the commonest duck in Swedish Lapland, just below the Arctic circle.

The Goosander (*Mergus merganser*) is rare, but the Red-breasted Merganser (*M. serrator*) is extremely common, especially in the neighbourhood of rapids; its Finnish name signifies "rapid-bird." The Smew (*M. albellus*) is well known to the Finns, chiefly from the value of its eggs; there was no nest in the district this year, and it is always very rare.

The Willow Grouse, Ptarmigan, Hazel Hen, Black Grouse, and Capercailzie all occur, but game birds were scarce this year.

The Crane (*Grus communis*) seldom breeds so far north as Kaaresuando, though it does so in the Muonioniska district, where Wolley made his celebrated discovery of its nesting haunt.

The Dotterel (*Eudromias morinellus*) breeds on the higher grounds, and we observed it on July 23rd when crossing the frontier on our way back.

We found the Ringed Plover breeding in the neighbourhood of Kaaresuando on July 8th. The Golden Plover was one of the commonest birds on the Uoma, where its melancholy call was heard all through the night.

We obtained eggs of the Red-necked Phalarope (*Phalaropus hyperboreus*) from Kaaresuando, but did not often meet with the birds, which are known to the Finns as "Swimming Snipe." We did not meet with the Great Snipe (*Gallinago major*), but obtained eggs of the Jack Snipe (*G. gallinula*) from the Finnish side of the river at Kaaresuando, where there are some large marshes. We failed to meet with the Broad-billed Sandpiper (*Tringa platyrhyncha*); the skulking habits of this bird render it extremely difficult to observe. We saw the eggs of this species, however, at Kaaresuando, and a Finn who was searching for us found two of the young in down.

We obtained eggs of Temminck's Stint, as well as the young in down. These birds frequent grass meadows in the neighbourhood of houses, and may be seen perched on stakes or trees uttering a faint *purre* resembling faintly the note of the Dunlin. The actions of the male bird (for we never saw the female) at the nest were very interesting. He would sit calling on a stake till he thought there was no danger, when he would fly down, hover above the spot, and then skim back to the post. After repeating this manœuvre several times he would drop in the grass, when his note changed to a quick continuous twitter.

The Ruff (*Machetes pugnax*) was very numerous in the marshes round Kaaresuando, where we obtained eggs. As one lay watching birds in the marsh they would keep passing and repassing over our heads uttering a low croak.

It seems the rule rather than the exception for the wading-birds on the Muonio to alight on trees or posts, and we noticed the following species continually perching, *viz.*, Ruff, Temminck's Stint, Common, Green, and Wood Sandpipers, Dusky Redshank, Greenshank, and Whimbrel.

The Common Sandpiper (*Totanus hypoleucus*) positively swarmed; they were quite as common as sparrows. We did not see many Green Sandpipers; but while we were at Kaaresuando some Russian Finns brought us some Sandpiper's eggs which they had found in a tree in an old nest of the Fieldfare; they said that the bird was like the Common Sandpiper, but had longer legs. We found the Wood Sandpiper (*T. glareola*) very abundant, and handled the young in down. The alarm note is a continual "tchick-tchick" or "giff-giff," generally uttered from the top of a stake or bush. The bird will often follow an intruder long distances to decoy him away from its young, which are of a greyish colour, with a conspicuous black stripe down the back. We watched one brood in particular for a long time on July 7th, close to Kaaresuando. Having caught the young we placed them first in one part of the marsh, then in another, lying down close to watch them. The male bird would run excitedly in and out of the tussocks, searching everywhere till he heard their feeble chirp. Then he would run towards them and settle down a yard or two off, quickening his note to a continuous "giff-giff-giff." Then all the young had to tumble along laboriously (for they could hardly walk) till they reached the male bird, who tucked them safely under his wings; once or twice the female bird appeared on the scene for a minute or two, when both would soar in the air like drumming Snipe, and pitch down uttering a cry resembling their Finnish name "Leero." The Wood Sandpiper is known as the big "Leero," and Temminck's Stint as the little "Leero."

The Common Redshank (*Totanus calidris*) was only observed once, when we saw a pair on July 20th at Keinovuopio. The Finns did not know what they were. The Dusky Redshank (*T. fuscus*) was first met with about thirty miles above Kaaresuando, where they were common. By the beginning of July they were all over the marshes, whither they had brought their young from the fir-clad hills where they breed. We saw a good many eggs of this bird at Kaaresuando, which breeds early. The Finns call it "Reevat" from its cry, which, however, seemed to us to be better syllabled "vikla," the Finnish name for the Greenshank. The male in his sooty breeding plumage is a beautiful bird; but is not so much seen as the female. When approached they both soar, hover, and stoop above one's head, going through every conceivable movement in mid-air. Their note is then a clear "tjew," and this sometimes goes off into a "kick-kack, kick-kack" like a drumming Snipe when he is descending. The Greenshank (*T. canescens*) was fairly common along the river-side: when their young were approached they were very tame and confiding, and would balance themselves on the top of a post, or on the topmost twig of a bush, within a few yards of us. Their cry "tjeuty" is wonderfully resonant.

The Bar-tailed Godwit (*Limosa lapponica*) is known to the Finns, but we failed to meet with it.

The Whimbrel (*Numenius phæopus*) was very common; and in one place, a barren, terrace-like plain which skirts the rapids for several miles, we found hundreds nesting. The Curlew (*N. arcuatus*) was not seen.

We were somewhat surprised to find the Arctic Tern nesting on the Uoma, and on small islands in the lakes, where they were fairly numerous, and were seen fishing everywhere. Their Finnish name "Tirro" almost exactly reproduces their cry.

The Black-throated Diver (*Colymbus arcticus*) was very numerous, and served us as a good weather prophet. We obtained two eggs of this species on June 29th from an island in a small lake called Tauki-järvi, near Keinovuopio. The Red-throated Diver (*C. septentrionalis*) was less numerous, but fairly common near Kaaresuando. We obtained one egg on June 16th from an island in the rapids called Karjalakoski.

THE MIGRATION OF BUTTERFLIES.

By the Editor.

In the month of April last Mr. T. J. Mann, who was then sojourning in Ceylon for the benefit of his health, sent me a small collection of butterflies captured at Navanghena, with the following interesting note:—

"In this island, during the months of March and April, there is a vast migration of butterflies from N.E. to S.W. They appear not merely in hundreds, but in thousands, perhaps millions. This movement of countless numbers all going in one direction, as of set purpose, was first noticed this year about March 15th in the northern part of the island; and at a moist spot in the otherwise dry bed of a river, where they had apparently alighted to get moisture, the ground was quite white with their wings, reminding one of what one sees at home under the hawthorn trees when, after a sharp shower, the ground is strewn with may-blossoms. The migration, for such it appeared to be, commenced about 7 a.m., and lasted until noon, when there was a lull, or temporary cessation of flight, after which the movement recommenced, and the insects continued to pass on in swarms as before. I send you a series of specimens for identification; they will probably prove to be males and females of one species, and no doubt you will be able to name them, or get them named. I may add that large numbers of apparently the same butterflies were observed by friends one hundred miles out at sea to the S.W. of Ceylon."

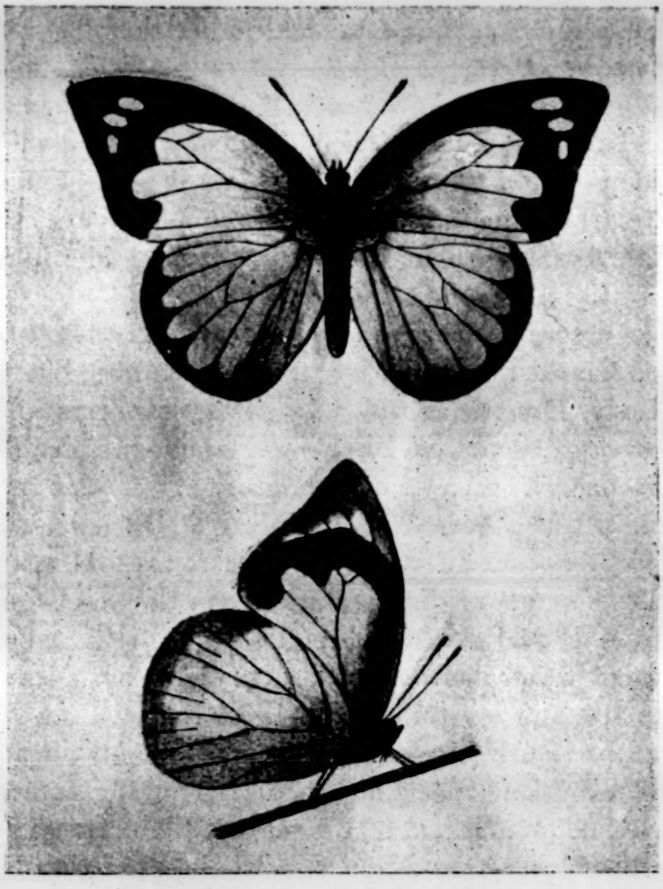
On receipt of this note I at once took steps to identify the species from the specimens sent; and with the aid of Mr. F. Moore's beautifully illustrated work on the Lepidoptera of Ceylon, and the assistance of Dr. A. G. Butler, who kindly looked out specimens for comparison in the British Museum Collection, it was soon apparent that the insects captured by Mr. Mann were males and females of an Asiatic black and white butterfly tolerably well known to entomologists as *Catophaga galena*, Felder, having a general resemblance, both in size and colour, to our Cabbage Butterfly, and not unlike *C. lankapura*, Moore, excepting on the under surface, which is less yellow in the male, and pearly in the female instead of orange.

Phenomena such as that witnessed by Mr. Mann are not unrecorded, although little or no attempt has been made at explanation. Sir J. Emerson Tennent, in his 'Natural History of Ceylon,' says:—"At times the extraordinary sight presents itself of flights of these delicate creatures, generally of a white or pale yellow hue, apparently miles in breadth, and of such prodigious extension as to occupy hours, and even days, uninterruptedly in their passage—whence coming no one knows; whither going no one can tell." He adds in a foot-note:—"The butterflies I have seen in these wonderful migrations in Ceylon were mostly *Callidryas hilariæ*, *C. alcmeone*, and *C. pyranthe*, with straggling individuals of the genus *Euplœa*, *E. coras* and *E. prothoë*. Their passage took place in April and May, generally in a north-easterly direction. A friend of mine travelling from Kandy to Kornegalle drove for nine miles through a cloud of white butterflies which were passing across the road by which he went."

In this observation, and in the case mentioned by Mr. Mann, it will be noted, first, that the species recognised were not identical (although not distantly related), and, secondly, that the insects were travelling in precisely opposite directions, a circumstance which suggests that the direction of their flight may in some measure depend either on the prevailing wind at the time of the occurrence, or upon certain atmospheric conditions such as influence the migrations of birds.

Nor is it in Ceylon only that this phenomenon has been observed. In South America something of the kind was witnessed by Darwin, who has thus graphically recorded the observation in his 'Naturalist's Voyage in the Beagle':—

"Several times when the ship has been some miles off the mouth of the Plata, and at other times when off the shores of Northern Patagonia, we have been surrounded by insects. One evening when we were about ten miles from the Bay of San Blas, vast numbers of butterflies, in bands or flocks of countless myriads, extended as far as the eye could range. Even by the aid of a telescope it was not possible to see a space free from butterflies. The seamen cried out "it was snowing butterflies," and such in fact was the appearance. More species than one were present, but the main part belonged to a kind very similar to, but not identical with, the common English *Colias edusa.* Some moths and Hymenoptera accompanied the butterflies; and a fine beetle (*Calosoma*) flew on board. Other instances are known of this beetle having been caught far out at sea; and this is the more remarkable, as the greater number of the *Carabidæ* seldom or never take wing. The day had been fine and calm, and the one previous to it equally so, with light and variable airs. Hence we cannot suppose that the insects were blown off the



Catophaga galena, Felder, ♂ and ♀. Navanghena, Ceylon.

land, but we must conclude that they voluntarily took flight. The great bands of the *Colias* seem at first to afford an instance like those on record of the migrations of another butterfly, *Vanessa cardui* (Lyell's 'Principles of Geology,' vol. iii. p. 63); but the presence of other insects makes the case distinct, and even less intelligible. Before sunset a strong breeze sprung up from the north, and this must have caused tens of thousands of the butterflies and other insects to have perished."

The late Mr. Bates, in his delightfully written book, 'The Naturalist on the River Amazons,' alluding (vol. ii. p. 227) to the number and variety of beautiful butterflies which he met with in his excursions round Ega, says:—"It was impossible to walk far without disturbing flocks of them from the damp sand at the edge of the water, where (as in the case noted by Mr. Mann) they congregated to imbibe the moisture."

Even as regards European Lepidoptera, something of the kind has been remarked in the case of a well-known butterfly, the Painted Lady, *Vanessa cardui*. In some years this species has been observed to be not only unusually abundant, but moving in numbers in one direction as if on migration. A very remarkable illustration of this occurred in the spring of 1879, when the Rev. H. Harpur Crewe, on his way to Spain and the Balearic Islands, saw countless numbers of this butterfly in the neighbourhood of Valencia and Barcelona from April 26th to 30th inclusive. A similar phenomenon was observed in the island of Minorca from May 1st to 3rd, and again in travelling by railway from Barcelona to Paris on the return journey. So remarkable was the abundance of *Vanessa cardui* at that time, not only in the countries just mentioned, but in England, France, and Germany, that Mr. R. McLachlan, to whom Mr. Crewe's observations were communicated, thought it worth while to collect and summarise all the particulars he could gain on the subject from English and continental naturalists. These details he published in the 'Entomologist's Monthly Magazine' (vol. xvi. pp. 49—51), from which the following may be quoted:—

"On June 15th, near Sèvres, great swarms appeared flying from S.S.E. towards N.N.W., the wind being S.S.W. At Strasburg from the 3rd to 9th June a similar occurrence was observed. At Bischeim on June 7th, and also at Kehl, on the same day, myriads flew in the afternoon, at the former place from the S.W., at the latter from the S.E., so that it was thought the columns were not identical. At Angers a similar thing was observed on June 10th, the direction being from E. to W. against the wind, which was not of much force. It was estimated that the number passing along a single street in one hour was from 40 to 50,000. At Würtemberg, from June 1st to 8th, an incessant migration from S. and W. towards N.E. and E. was remarked. In the

THE PAINTED LADY, *Vanessa cardui*, ♂ and ♀.

Canton Zurich, on June 7th, an immense swarm moved from S.W. to N.E., principally from 3 to 5 p.m.; this flight went persistently in one direction, only changing temporarily to avoid houses and trees. At Steyer in Upper Austria, on June 11th, surprising numbers flew ceaselessly from S.W. to N.E.; between 1 and 2 p.m. 90 to 110 per minute were counted in a space of about 100 paces, and the swarm was estimated to have been above rather than below 1,000,000."

These particulars, amongst others given by Mr. McLachlan, will suffice to show the very extraordinary nature of the migration of *Vanessa cardui* observed in that particular year.

Commenting upon the facts, Mr. McLachlan says (*l. c.*):—"There can, I think, be little doubt that all the swarms consisted of individuals that had hybernated; there can also be little doubt they were migrating, and that the column had become dispersed before remnants of them reached our shores, and other parts of the North of Europe. . . . Whence came they? Were they all bred the previous autumn? or is it possible the insect may be able to rest quiescent in the perfect state over a series of years until the accumulated numbers simultaneously wake up? The whole subject is surrounded with difficulties."

When exhibiting the Ceylonese specimens, forwarded by Mr. Mann, at a meeting of the Linnean Society on the 6th of June last, I remarked that these curious flights of butterflies could not be regarded as quite analogous to the migration of birds, which travel in opposite directions in spring and autumn; for the insects travel only in one direction and do not return, vast numbers perishing *en route*. The phenomenon resembles rather what has been observed of Lemmings,* Locusts,† and Dragonflies,‡ and may be explained as a sudden exodus from the birth-place, leading to a compensating reduction of the species after a season exceptionally favourable to its increase. In this view Col. Swinhoe, whose extensive acquaintance with the Lepidoptera of India and Ceylon is well known, has expressed his concurrence. But since these remarks were made, some additional and most interesting information has come to light, and from an unexpected source. Herr Gätke, who for fifty years has devoted himself to a study of the migratory birds which visit Heligoland, has published, in a bulky volume, the results of his observations, and an English translation of the German text has just been issued.* In this volume will be found some extremely interesting observations on the migration of butterflies, from which the following is an extract:—

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* Crotch, Linn. Soc. Journ. xiii. pp. 27–34 (1878); additional note, p. 83. Further remarks, pp. 157–160 pl. xiii. Collett, *tom. cit.*, pp. 327–334. Somerville, Proc. Zool. Soc., 1891, pp. 655–658.

† See Layard, 'Birds of South Africa,' pp. 291, 314; and Andersson, 'Birds of Damaraland,' p. 264.

‡ Several of the larger species of *Libellula* occasionally migrate, but the phenomenon is of rare occurrence, and the circumstance which brings about such an uncommonly numerous development of the perfect insect must be very peculiar. See Weissenborn, on a remarkable migration of *Libellula depressa*, Mag. Nat. Hist., n.s., vol. iii. p. 516; and Hudson, on "Dragonfly Storms" (composed chiefly of *Æschna bonariensis*), 'The Naturalist in La Plata,' pp. 130–134. See also Gätke, on the migrations of *Libellula quadripunctata*, Heligoland, p. 89.

"That Lepidoptera during their more extended flights are subject to the same meteorological influences as birds, I have been convinced by the experience of many nights in July, during which I have caught numerous nocturnal Lepidoptera not belonging to our insect-fauna, the weather of these nights being invariably such that, if it had occurred a few weeks later, it would have conducted hither innumerable Wheatears. It has, in fact, occurred repeatedly that Lepidoptera, especially night-flying species, have passed over this island in countless swarms at the time of powerful bird-migrations. Thus, during the night of the 25th of October, 1872, thousands of *Hybernia defoliaria,* mixed with smaller numbers of *H. aurantiaria,* passed over the island in the company of large numbers of Larks. And again, in the night of the 11th of October, 1883, during which an unusually strong migration of all the species of birds due at that time took place, this was accompanied by the appearance of very large swarms of the same species of *Hybernia.*

"White Cabbage Butterflies, the Black Arches, *Psilura monacha,* and also *Libellulidæ* (*Libellula quadripunctata*) have been seen to pass here in migratory flights of astonishing proportions, though even these do not come up to those of *Plusia gamma,* which on repeated occasions have occurred in numbers of which it would be quite impossible to form any conception. Thus, during the nights from the 15th to the 19th of August, under the favourable conditions of a south-easterly wind and fair weather, a considerable migration of birds took place. On each of these nights, from 11 p.m. to 3 a.m., the small *Noctuæ* above referred to were seen at the lighthouse, passing from east to west in undiminishing numbers, like the flakes of a dense snowstorm. These small creatures also manage to cross the North Sea in safety, for they often arrive on the east coast of England suddenly, and in such remarkable numbers that we can only believe them to be immigrants. In fact, as my friend Mr. John Cordeaux informs me, an enormous accumulation of these insects actually took place at a time corresponding to that of the above observations." (P. 117.)

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* 'Heligoland as an Ornithological Observatory: the result of fifty years' experience by Heinrich Gätke.' Translated by Rudolph Rosenstock. Roy. 8vo. Edinburgh: David Douglas. 1895.

Further on Herr Gätke writes:—

"Both the theory of inheritance as well as that of tradition are quite untenable in regard to the periodical migratory phenomena of other animals endowed with the power of flight, such as beetles and nocturnal Lepidoptera. Among the latter the migrations of *Plusia gamma* furnish in Heligoland excellent material for observation. During their autumn migrations these small moths travel from Slesvick-Holstein to England, across the North Sea, a breadth of water of four hundred miles in extent. They pass this island in enormous swarms, resembling, as seen from the lighthouse, a dense snowstorm driven by a light breeze. Thus, according to an entry in my journal for 1882, on the night from the 15th to the 16th of August, with a very light south wind, a powerful migration of birds occurred:—'From 11 p.m. to 3 a.m. millions of *Plusia gamma* were travelling from east to west, like a dense snowstorm.' 'Again, on the nights of the 16th, 17th, and 18th, large numbers of *P. gamma* passed the island, the migration commencing each evening at 11 o'clock. On the 19th the wind was south-east, the weather fine and calm. In the evening the sky became over-cast, and a strong migration of birds took place. From 11 p.m. until 2 a.m. thousands of *P. gamma* were again seen.' A thunderstorm, with high winds, subsequently put an end to the migration. These little insects also follow an east-to-west course of migration, and they adhere to it with as much steadiness and precision as the different migratory hosts of birds which are observed here. That they, too, accomplish their journey in safety is shown by the enormous swarms of them which frequently cover the east coast of England, and which can only be explained as the result of an immigration. Besides *P. gamma* large numbers of *Gastropacha neustria*, *Agrotis graminis*, and other species, are represented in such migratory swarms. It has been suggested that these insects are attracted by the light of the lighthouse, and that, consequently, it is only around the latter that they are seen in such quantities; this, however, is contradicted by the migrations of *Hybernia defoliaria* and *H. aurantiaria*, these insects sometimes making their appearance during strong migrations of Larks in October, when large numbers of them may be found in the course of the night, as well as on the following morning, from one end of the island to the other. Now it is quite impossible that these moths should be able to collect experiences of any kind during this single migration of their life, which, moreover, is performed in the darkness of night across a wide expanse of water; and even if they did these would be perfectly useless, for these migrants die shortly after their autumn migration without having produced further offspring to which they could commit their experiences, either by hereditary transmission or by personal instruction."

On the subject of migrating Dragonflies, Herr Gätke remarks :—

"Another very peculiar phenomenon, also intimately connected with thunder-storms, is the regular but temporary appearance, in millions, of the large Dragon-fly (*Libellula quadripunctata*) before such disturbances. Countless swarms of these insects make their appearance all of a sudden during the calm sultry hours preceding the catastrophe, while thunder-clouds gather on the horizon, and, heaped upon each other, project into the blue ether beyond, like so many giant mountains of snow.

"The direction whence these insects proceed cannot be ascertained, nor do they arrive in swarms or companies, but solitary individuals or scattered groups probably congregate on the spot in one vast throng. The assembling individuals or groups must, however, follow each other in very rapid succession, for in a short time the face of the cliff, still illumined by the sun, all the buildings, hedges, and dry twigs on the island, are covered with them. Nor is it necessary for the occurrence of this phenomenon that the storm should actually discharge itself over Heligoland, or even in its immediate neighbourhood, but only that the thunder-clouds extend over about two-thirds of the whole expanse of sky as measured from the horizon to the zenith. The insects vanish as suddenly as they appear, so that hardly one of them is discoverable on the following morning. It is not known whether they proceed further west, though this is probably the case. It is certain, at any rate, that they do not remain here, otherwise one would undoubtedly find them lying about dead after the heavy rain of a thunder-storm."

Herr Gätke has expressed his conviction (*op. cit.* p. 116) that Lepidoptera during their more extended flights are subject to the same meteorological influences as birds, and it is curious that in regard also to Dragon-flies it should have been observed by himself (p. 89) and by Mr. Hudson (*op. cit.* p. 131), of different species in two very different quarters of the globe, that these swarms of insects suddenly make their appearance immediately *before* some atmospheric disturbance, such as a heavy thunder-storm or a high wind.

It is observable also that while superabundance of life, in the case of the Lemming and Locust, requires to be checked by the intervention of certain natural enemies—the former being attacked by Owls, Hawks, and Buzzards, the latter by Pratincoles and Storks*—no such interference has been observed in the case of Butterflies and Dragonflies, more lowly organized creatures, which go to their destruction unharassed, yet driven as it were by some inherited impulse which they are apparently unable to withstand.

From the incomplete nature of the statistics at hand it is not possible to draw any definite conclusions as to the cause of the migrations observed; but taking the case of *Vanessa cardui* as furnishing the greatest number of recorded observations, the following statements may be taken as fairly correct, or at least as warranted by the evidence :—

(1) The migration does not take place annually, but at irregular intervals, and only in those years in which there has been an abnormal abundance of the species, or failure of the food plant; when there is, so to say, a surplus population to be got rid of.

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* *Pratincola nordmanni* and *Ciconia alba*, known respectively to African colonists as the "Small" and "Great Locust-birds."

(2) The sexes do not migrate separately as is the case with certain birds.

(3) Butterflies do not invariably fly with or before the wind. They have been observed passing from S.S.E. to N.N.W., with the wind at S.S.W., and even going due W. with the wind blowing from that quarter. This negatives the suggestion that they are irresistibly carried away by a current of air.

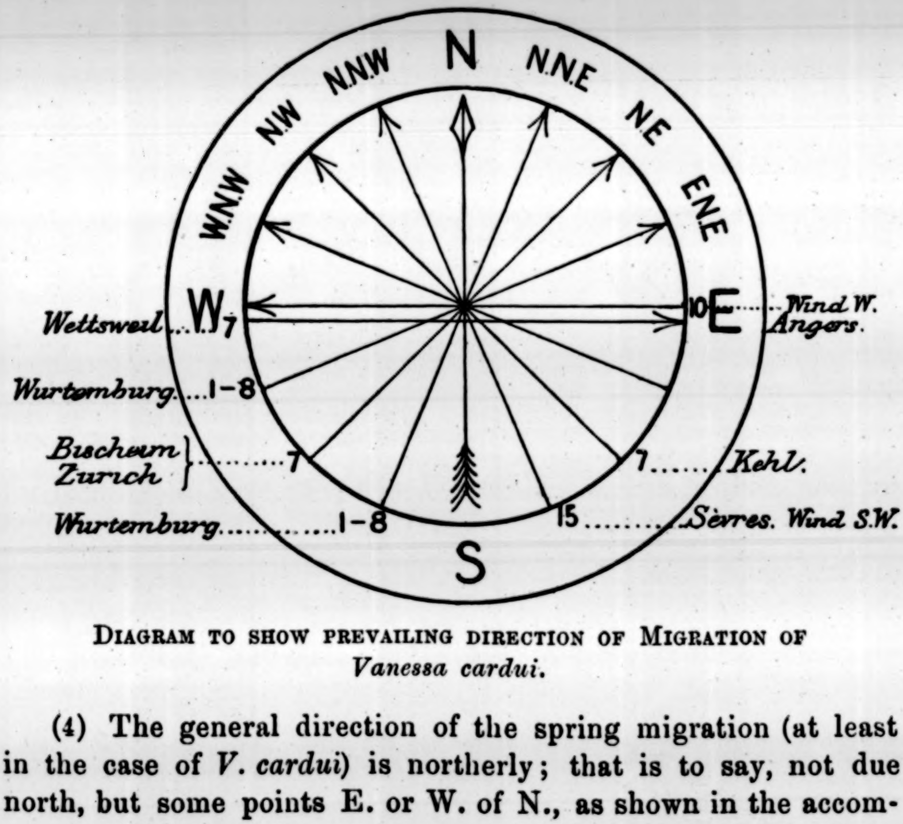


DIAGRAM TO SHOW PREVAILING DIRECTION OF MIGRATION OF *Vanessa cardui*.

(4) The general direction of the spring migration (at least in the case of *V. cardui*) is northerly; that is to say, not due north, but some points E. or W. of N., as shown in the accompanying diagram. In no instance, so far as the records show, have any flocks been observed at that season of the year going south, or in any southerly direction.

(5) There is no return journey in autumn in a direction opposite to that taken in spring.

There are other points upon which no certain information is at present available. For example, we have yet to learn whether butterflies have a sense of direction—as is probable, not merely from what has been above stated, but from their going towards particular flowers, and making choice of particular food-plants upon which to deposit their eggs—or whether in the course of their migrations they are merely actuated by an inherited and uncontrollable impulse. Taking it for granted that thousands of individual butterflies perish during these periodical migrations, while a certain number reach their destination—or at least arrive at some destination where they may rest, recuperate their strength, and continue their species—do they in point of fact discover some suitable food-plant for the nourishment of their larvæ? If so, when eventually the pupæ are transformed to perfect insects, do the latter in their turn migrate as did their progenitors? and towards the north? in which case some limit must eventually be reached, to pass which would prove fatal to the species? In the alternative, all the migratory hosts must perish, and the perpetuation of the species must be left to those individuals which at the period of the general exodus do not quit the land of their birth. But here again we stand in need of facts. Are any individuals left behind at the period of migration? or do the female insects previous to their departure take care to deposit their eggs, and thus ensure the foundation of a future colony?

Those who reside in or visit localities wherein these curious migrations are observable would do well to enquire into the subject more closely, with a view to clear up some of the difficulties which are here suggested.

NOTES AND QUERIES.

MAMMALIA.

Spread of the Roe-deer in S.W. Scotland.—It is rather surprising, now that Roe-deer are so plentiful in the district, that they are so strange and unfamiliar to the eye of most folks. It is only about twenty years, or a little more, since they reappeared in the south-western counties after a very long absence, but now they are found all over the district, and some copse-woods contain them in comparatively large numbers. I have seen no less than four of these pretty little deer gambolling together within twenty yards of the public road at a Troqueer locality not much over a mile from the end of the New Bridge.—Robert Service (Maxwelltown, Dumfries, N.B.).

White Hedgehogs.—On August 11th, while going round the coverts to look at some vermin traps, I found in one of them a Hedgehog that was quite white. Never having seen a white one before, I think you might be glad to hear of it.—THOMAS HARDBOTTLE (Gamekeeper, Kilburn, Easingwold).

[White Hedgehogs no doubt are occasionally met with, but not very often reported. Charles Waterton, whose name is familiar to naturalists, once had a family of milk-white Hedgehogs in his park at Walton Hall, near Wakefield (Zool. 1866, p. 195). Mr. J. O. Harper, of Norwich, communicated the fact that he had obtained a white Hedgehog in the parish of St. Faith's, near Norwich, in October, 1850, and added that on dissection he found the nerves in connection with the muscles for the contraction of the skin to be greatly diseased (Zool. 1851, p. 3022). In December, 1878, another white Hedgehog was caught in Wrest Park, Bedford. See 'Zoologist,' 1879, p. 172.—ED.]

London Rats crossing the Thames.—A most remarkable sight was witnessed during the burning of the large grain warehouse near Blackfriars Bridge on August 31st last. When the fire was at its height a great stir was noticed in the waters of the Thames, which for some time could not be accounted for. Before long, however, the spectators on the embankment discovered that it was caused by immense numbers of rats which had been driven by the heat from the burning building. They appear to have left the place *en masse*, for they were all gathered together and made their way across the water in one crowd. Unfortunately for the rats, but fortunately for the dwellers on the opposite side of the river, they could find no landing-place, and most of them found a watery grave. Rats, although essentially land animals, are not without the power to swim, but, like all other animals which take to the water by force of circumstances, and not from choice, they are not long before they become exhausted. It is probable, therefore, that those which swam across the river and could find no landing-stage on the embankment were too exhausted to return to the Surrey side, and so perished.

Whiskered Bat in Derbyshire.—Through the courtesy of Mr. G. F. Gee, I have been able to examine a Whiskered Bat, *Vespertilio mystacinus*, which was killed last June, in broad daylight, at Cromford.—CHARLES OLDHAM (Romiley).

Common Seal at Scarborough.—On August 24th a Common Seal, *Phoca vitulina*, was shot at Scalby Ness, in the North Bay, Scarborough. The animal, which was a young male of very pale colour (almost entirely without the usual dark dappling on the back), had been left by the tide in a pool on the rocks, and when seen was making the best of its way back to the open sea.—WILLIAM J. CLARKE (44, Huntriss Row, Scarborough).

BIRDS.

Migration of Pied Wagtails.—August 15th. The Wagtails are beginning to assemble on my lawn daily, as they do every year about this time. I suppose they are on their way to southern climes. Great numbers of them are to be seen on some mornings at this season in the park here. This continues for about a fortnight or three weeks, when nearly all depart. —J. G. Hamling (The Close, Barnstaple).

Quails in Nottinghamshire.—There are three pairs of Quail evidently nesting close to the house here,—two pairs in clover and one in barley. Formerly we often shot Quail in September; now they are not often seen, and it is several years since I flushed one in the shooting season. Common Sandpipers had returned here from their breeding-places by 24th of July.—J. Whitaker (Rainworth, Mansfield, Notts).

White-fronted Goose in St. Kilda.—It may perhaps interest Mr. Steele Elliott, whose notes from St. Kilda are printed in the last number (p. 281), if I mention the White-fronted Goose (*Anser albifrons*) as a recent addition to the fauna of that island. An adult male of this species, a solitary straggler, was shot on St. Kilda in June of the present year; and, as it was a handsomely-marked bird, I had the pleasure of sending it to Mr. W. Eagle Clarke for the collection in his charge at Edinburgh. *Apropos* of *Fulmarus glacialis*, when I visited St. Kilda a few years ago to obtain the downy young of this species, I found that the nestlings appeared to be from three days to a week old upon the 10th of July. This year some young Fulmars were sent to me from St. Kilda during the first week of August. The largest had lost a great deal of the nestling down, and they had all begun to develop their quills. I may add that a very pretty Pied Puffin was sent to me from St. Kilda this year. The whole of the upper parts are varied with white feathers in this bird. Of course such varieties of *Fratercula* have been often recorded, but they are seldom to be seen in public museums. This bird is being mounted for the Carlisle Museum.—H. A. Macpherson (Carlisle).

[We received a notice of this occurrence from Mr. Steele Elliott, but too late for insertion in the last number, which was then in the press.—Ed.]

Water Pipit at Tetney Haven. — On April 5th I shot a Pipit at Tetney Haven on the Lincolnshire coast, which at the time I supposed to be the Scandinavian form of *Anthus obscurus* in summer plumage, but subsequently Mr. Cordeaux, having seen the skin, pronounced it to be an example of *Anthus spipoletta;* and Professor Newton and Mr. Dresser, who were kind enough to examine the specimen, concurred in this opinion. This is the first occurrence of this species in Lincolnshire.—C. H. Caton Haigh (Aber-Iâ, Penrhyndeudraeth, Merionethshire).

Period of Incubation with the Shag. — When visiting a nesting haunt of the Shag or Green Cormorant in Shetland on May 6th last I was somewhat surprised to find that most of the nests had their full complement of eggs, apparently a good deal incubated. A few, indeed, contained young, some of which must have been fully a week old. This is eight days earlier than on the Saltees, as recorded by Mr. Ussher (Zool. 1890, p. 436). Taking the incubation period for the Shag as a month — that of the Cormorant being twenty-eight to twenty-nine days, according to Mr. Evans "On the Incubation Period of Birds" ('Ibis,' Jan. 1891)—some of the eggs at this locality must have been laid by the end of March. This is perhaps abnormally early, yet the date given, May and June, in the lately published book on Oology by C. Dixon, is far too late, and refers undoubtedly to second layings. Though I have seen many hundreds of Shags' nests, yet I have never till this season found one containing more than three eggs. This year, however, one with four eggs was noted. Another nest contained no less than seven, but these had evidently been laid by different birds, three of them being of one type, and probably belonging to the rightful owner of the nest, while the other four were all different and in different stages of incubation. Other nests in the immediate vicinity of this one contained only one egg apiece. It is reported by the Shetland fishermen that the "Scarf," as it is there called, has greatly increased of late years. The bird is bitterly hated by them, and used to be destroyed to some extent at the nesting period, but this has of course been now stopped. The colony of Green Cormorants on the "Horse of Burrasoe," Yell, certainly numbers over 2000 pairs at a moderate estimate.—HAROLD RAEBURN (31, Buccleuch Place, Edinburgh).

Arctic Tern and Common Gull breeding in Shetland.—In the loch of Grumnavoe, in the mainland of Shetland, there is a small island which rises several feet above the water, and is densely clothed with a broad flag-like vegetation. On this island, which I visited on June 24th last, I found a colony of the Arctic Tern breeding in company with the Common Gull and other species. Most of the Terns' nests were situated on the grassy upper tract, and each was formed of pieces of dry flags placed together without any tidiness or compactness, but in sufficiently thick layers to keep the eggs dry. This note will be of interest in view of Dixon's statement ('Nests and Eggs of British Birds,' p. 307) concerning the nidification of the Arctic Tern, that no lining is ever used.—ROBERT GODFREY (46, Cumberland Street, Edinburgh).

Avocet in Kent.—During the last week of August an Avocet, *Recurvirostra avocetta*, was shot not far from the North Foreland, and was brought to me the following day. It was a bird of last year, in very good condition. The shooter reported that there were three in company, only one of which he secured.—W. OXENDEN HAMMOND (St. Albans Court, Wingham).

The Marsh Tit in Dumfriesshire.—About 1840, according to the late Sir William Jardine, Marsh Tits were not uncommon in Dumfriesshire, while Coal Tits were scarce. The very reverse is the case now-a-days;

indeed until within the last few years I had never seen the Marsh Tit within a considerable radius of Dumfries. In one or two spots of Upper Nithsdale, and in parts of Annandale, a pair or two were usually located. The species seems to be gradually spreading again, and I have observed three pairs in different places in the Stewartry side of the Nith.—Robert Service (Maxwelltown, Dumfries, N.B.).

BATRACHIA.

Natterjack Toad in Dumfriesshire.—Few people are aware that, so far as Scotland is concerned, we in this district have a monopoly of the Natterjack, *Bufo calamita*. Some time ago I was applied to by a friend at a distance to procure for him a few Natterjacks. For this purpose I repaired to the shore below Kirkconnell Lea, and searched for over three hours, but for some reason or other failed to turn up a single specimen. They are usually found under stones just above high-water mark. Failing here, I thought of Southerness, the other locality where these curious little Toads are sometimes got; and there I found them at once in the usual situation, and procured the required number. They are found all round the shore from the Lighthouse to the head of Gillfoot Bay. They are curious little fellows, smart and lively, singularly flattened in aspect, and with more "life" about them than the Common Toad appears to have. The yellow stripe down the back, and brown warts, give them quite an ornamental look. It has never been explained why they should be found nowhere else in Scotland than at these two localities. In England also it shows a similar sporadic distribution.—Robert Service (Maxwelltown, Dumfries, N.B.).

[This confirms an observation made more than fifty years ago by Sir William Jardine, and communicated by him to Bell for his 'History of British Reptiles.' It is interesting to note that Southerness was then as now a recognized haunt of this somewhat local species.—Ed.]

MOLLUSCA.

Helix rotundata, M. (sinistrorsum, Taylor).—While searching in a garden here on Aug. 24th I found a reversed specimen of *Helix rotundata*, Müller. The shell measures about 5 m. across. The colouring is normal, the embryonic whorl being dull grey and without striæ, as usual; the intermediate whorls dark brown and the body whorl horn-colour, blotched with reddish brown. As the animal is alive I hope to be able to rear it to its full size.—Alfred Sich (Chiswick).

Errata.—P. 305, line 19 from top, for "Carmarthenshire" read "Carnarvonshire;" line 3 from bottom, for "Dobbre" read "Dobbie."

NOTICES OF NEW BOOKS.

The Royal Natural History. Edited by Richard Lydekker: with Preface by P. L. Sclater. In six volumes; illustrated with 72 coloured plates and 1600 engravings. Vols. II.—IV. London: F. Warne & Co. 1894–95.

Since our last notice of this work (Zool. 1894, p. 316) considerable progress has been made in the issue of parts, the punctual appearance of which every month is most commendable. Volumes II. and III. have been completed, and four parts (19—22) of Vol. IV. are already issued. The ground covered so far by the author comprises the whole of the Mammalia (in fifteen parts) and a considerable portion of the Birds (parts 16 to 22, the last issued).

As regards the classification, Mr. Lydekker divides the class Mammalia into eleven orders, which are dealt with in the following sequence:—

1.	Primates	Apes, Monkeys, and Lemurs.
2.	Chiroptera	Bats.
3.	Insectivora	Insectivorous Mammals.
4.	Carnivora	Carnivorous Mammals.
5.	Ungulata	Hoofed Mammals.
6.	Sirenia	Manatees and Dugongs.
7.	Cetacea	Whales and Porpoises.
8.	Rodentia	Rodents.
9.	Edentata	Sloths and Anteaters.
10.	Marsupialia	Pouched Mammals.
11.	Monotremata	Egg-laying Mammals.

It is not to be supposed that all these groups are separated from one another by differences of equal importance; for, as Mr. Lydekker points out, No. 10 differs from the preceding groups by characters of far more importance than do any of the preceding nine from one another, while members of No. 11 differ fundamentally from the first nine groups, but almost as markedly from No. 10.

In the first chapter the chief characteristics of the class Mammalia are pointed out, those of the orders being reserved for subsequent treatment in their proper place. In view of the great interest attaching to the natural history of the Anthropoid

Apes, we should have expected to find more particular reference to the literature of the subject; not a complete bibliography, of course, for that would entail too much labour and occupy too much space, but a selection of titles of the more important books or essays which have been published, with proper references to the periodicals in which the essays are to be found. This would be extremely useful to a reader desirous of pursuing the subject in greater detail than the space at Mr. Lydekker's disposal has enabled him to do.

This remark applies forcibly to the very short section on Fossil Apes (p. 57), in which the author, referring to the remains of a fossil Chimpanzee found in Northern India, in rocks belonging to the Pliocene or later division of the Tertiary period, draws the conclusion that India was the original home of the ancestors of all the large man-like Apes of the present day, and that from this centre their descendants have gradually dispersed to the eastward and south-westward. We have thus, he considers, an easy explanation of the present peculiar geographical distribution of the various groups of large man-like Apes now existing. Moreover, there is sure evidence, he says, that at an earlier part of the Tertiary period, known as the Miocene Age, at least one species of Anthropoid Ape (*Dryopithecus*) inhabited Western Europe, its remains having been found in France. Mr. Lydekker, as an accomplished palæontologist, could of course give chapter and verse for these statements, but the uninformed reader would have been glad to have, if only in a brief foot-note, a reference to the particular memoirs in which the discovery of these fossil remains in India and France may be found detailed.

In the order which includes the Monkeys the number of species is so large that their classification and diagnosis is a very troublesome matter, and we do not think that Mr. Lydekker has made it quite so clear as he might have done. For example, if in his prefatory remarks he had pointed out the chief characteristics which serve to distinguish the old world species from the new, and had then split up these sections into smaller groups, mentioning the peculiarities of each, his subsequent treatment of the species would have been not only less confusing to the reader, but would have rendered it very much easier to determine the name and systematic position of any particular species that might come under the reader's notice. His account of the Barbary

Ape (*Macacus inuus*), or, as he prefers to call it, "the Magot," following the example of Buffon, is very interesting in regard to the particulars respecting its lingering existence in Spain, especially on the Rock of Gibraltar, where it continues to be protected, having been originally imported thither by the Moors from Barbary.

Amongst the Lemurs and their allies, of which a considerable number are figured, we find some of the best illustrations, *Lemur varius*, *Hapalemur griseus*, *Chirogaleus furcifer*, being especially well executed. The Potto asleep (p. 233) is drawn in a characteristic attitude and nicely engraved. In these examples the chief faults of the printer, too much ink and too much pressure, have been fortunately avoided. The same cannot be said in the case of some of the Bats. The Greater Horse-shoe Bat, for example, figured on p. 263, is made to look nearly black, whereas it is naturally one of the very palest of its kind. The wing-membrane, instead of being pale and delicate and semi-transparent, is literally "as black as ink," which gives an appearance of solidity quite unreal. So with the Barbastelle (p. 271), Daubenton's Bat (p. 284), and even the Common Pipistrelle (p. 274), of which specimens might easily have been procured as a guide for colour, or rather tone. Illustrations of Bats in general works on Zoology seem to be always a stumbling-block to artists, engravers, and printers. They are scarcely ever correctly drawn, and as seldom well printed. Mr. Lydekker, in this order of Mammals, would have done well to have discarded as many as possible of the old blocks and to have prevailed on the publishers to substitute something newer and better.

The order Insectivora, it seems to us, has been somewhat scantily treated, both in regard to the selection of the species described, and to the illustrations, of which we do not find more than a score. In the case of the Water Shrew, of which a very inadequate illustration is given (p. 328), the figure does not accord with the description given in the text. It is said to be of the natural size, but is considerably less, and is black beneath where it should be white.

These may seem trivialities in the way of criticism; but if such faults as we have indicated are to be observed in the case of species with which we are well acquainted and of which specimens are easily procurable, it lessens our confidence in the accuracy of those of which we know little, and which may or may not be as faultily delineated.

In the order Carnivora we are sorry to find that the account of the Lion and Tiger alone occupy some forty pages of text. Half of this space at least might have been saved for the consideration of less-known species. Few wild animals are now better known than the Lion and Tiger; every book on travel and sport in Africa and India teems with information of some sort about them; every trait in their character, every peculiarity of habit must surely by this time have been described over and over again.

We should have been content with brief descriptions of species, accurate tables of measurement or weight, outline of geographical distribution, and references to reliable sources of information for further details on special points.

There is perhaps no point on which there has been so much exaggeration and misrepresentation as the measurement of Tigers. The greatest lengths recorded in the Badminton volume on Big-game Shooting (section India) have been recently severely criticised by a sportsman who, having shot no less than 83 Tigers in the course of his experience, is well qualified to express an opinion on the subject. His remarks, which appeared in 'The Field' of 17th August last, should be read *in extenso* by those who are interested in this subject. From the reliable statistics given by him it is clear that Mr. Lydekker must be in error when he states (p. 375) that "unusually fine specimens will reach, or even slightly exceed, a length of 12 feet; 12 feet 2 inches being apparently the maximum dimensions ascertained with any approach to accuracy." These dimensions evidently must have been ascertained from the skin and not from the dead animal. Those who have had experience in flaying wild animals are well aware that a dressed skin will easily stretch so as to measure a foot or two more than it did before removal.

On the subject of the European Wild Cat and its allies Mr. Lydekker has some interesting remarks, but in speculating on the ancestry of the Domestic Cat in different countries he has evidently omitted to consult De Blainville on the osteology of the mummied cats from Egyptian tombs, and an essay by the present writer on "The Origin of the Domestic Cat," which formed the subject of one of the Zoological Society's 'Davis Lectures,' might have furnished some useful hints.

Through the courtesy of the publishers, Messrs. Warne & Co., we are enabled to reproduce half-a-dozen of the illustrations, selected here and there from parts before us.

The figure of the Seal (*Phoca vitulina*) furnishes a characteristic attitude of an animal which, though common enough on many parts of the British coast, and occasionally found in rivers some distance from the sea, is seldom seen by the majority of people except in museums and zoological gardens. The account given of it by Mr. Lydekker is brief, though he conveys a good idea of its geographical distribution, which is very extensive.

THE SEAL, *Phoca vitulina.*

In the illustration of the European Wild Boar we recognise the master hand of Joseph Wolf, and regret that we do not find more of his work in the present volume. As a former denizen of English forests the Wild Boar is an animal to which a peculiar interest attaches, since it forms a connecting link, as it were, between past and present—between those extinct creatures whose former existence in our country is known to us only by the discovery of their fossil remains, and those which are still living at the present day. As a beast of the chase he has been renowned from the earliest times, and still continues to test the prowess of sportsmen in France, Germany, and other parts of the world, including India, where "Hog-hunting" (or

Pig-sticking, as it is also termed), in the opinion of many English officers and civilians who have tried it, forms the very *acmé* of sport.

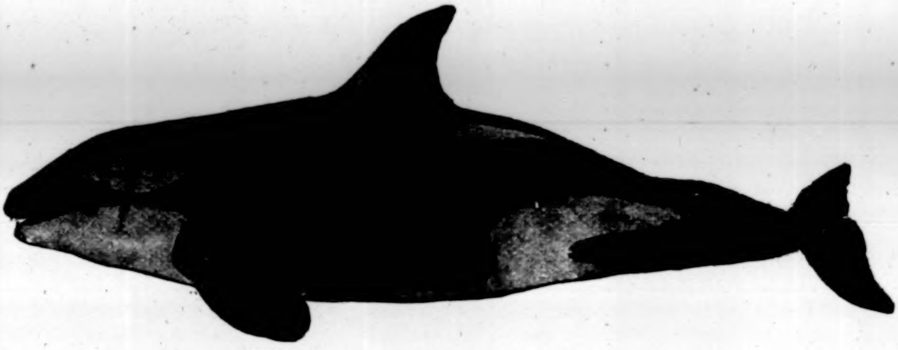
In the standard work of Bell on 'British Quadrupeds, including the Cetacea,' we have before now (p. 20) had occasion to regret the unsatisfactory nature of some of the illustrations, notwithstanding the excellence of the engraving.

The Wild Boar, *Sus scrofa*.

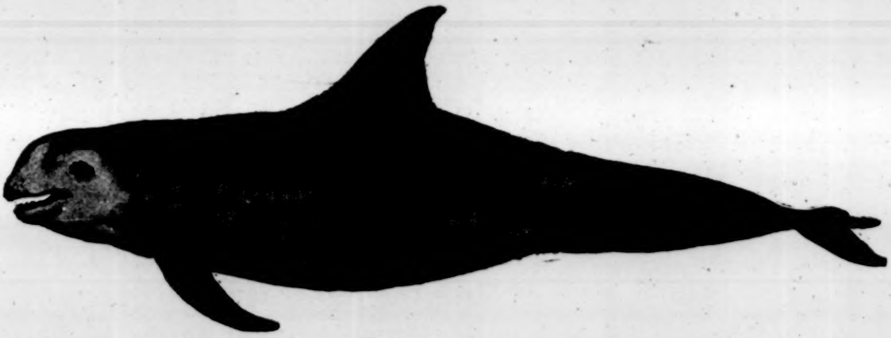
The figures of the Killer or Grampus (*Orca gladiator*) and of Risso's Dolphin (*Grampus griseus*), borrowed from a memoir by Mr. True (Bull. U. S. Nat. Mus. 1889), are here reproduced to show the effectiveness of "process-blocks" from drawings in black and white, when the surface of the animal to be represented is perfectly smooth and does not, as in the case of furred animals, lend itself to the treatment of line engraving.

The section devoted to Birds, in the 'Royal Natural History,' commences with Volume III., Part 15, and we turn to it with some curiosity to ascertain the scheme of classification adopted. On no subject is there greater diversity of views among zoologists than with regard to the classification of Birds (see Zool. 1894, pp. 469–470), owing, no doubt, in a great measure to the difficulty of determining what features should be regarded as of primary importance.

Mr. Lydekker has thought it "advisable," as he tells us (p. 303), "in a popular work of the present nature to revert to a modification of a scheme proposed some years ago by Dr. Sclater. Including certain extinct forms, Birds, according to this scheme, may be divided into twenty-five groups, of which the first twenty-two may be reckoned orders — such orders, be it understood, being for the most part far less distinct from one another than are those of Mammals.



THE KILLER OR GRAMPUS, *Orca gladiator.*



RISSO'S DOLPHIN, *Grampus griseus.*

1.	Passeres	Perching Birds.
2.	Picariæ	Woodpeckers, Cuckoos, Hornbills, &c.
3.	Psittaci	Parrots.
4.	Striges	Owls.
5.	Pandiones	Ospreys.
6.	Accipitres	Eagles, Falcons, Vultures, &c.
7.	Steganopodes	Pelicans, Cormorants, Gannets.
8.	Herodiones	Herons and Storks.
9.	Odontoglossi	Flamingos.
10.	Anseres	Ducks, Geese, and Swans.
11.	Palamedeæ	Screamers.
12.	Columbæ	Pigeons, Dodo, and Sandgrouse.
13.	Gallinæ	Fowls and Game Birds.
14.	Fulicariæ	Rails and Coots.
15.	Alectorides	Cranes and Bustards.
16.	Limicolæ	Plovers, Curlews, Snipe, &c.
17.	Gaviæ	Gulls and Terns.
18.	Tubinares	Petrels and Albatrosses.
19.	Pygopodes	Divers, Auks, and Grebes.
20.	Impennes	Penguins.
21.	Odontornithes	Toothed Birds (extinct).
22.	Crypturi	Tinamus.
23.	Stereornithes	Patagonian Flightless Birds (extinct).
24.	Ratitæ	Ostriches, Emus, &c.
25.	Saururæ	Long-tailed Birds (extinct).

As, according to Mr. Lydekker, the number of species of existing birds is considerably over 10,000, the space at his command has necessitated a much briefer treatment of the class than is the case with the Mammalia, and he seems to have made a fairly good selection of the families and genera to be noticed. We see no justification, however, for the remark that "for the anatomy of the soft parts of birds the reader must be referred to other works." This part of the subject ought surely to have been dealt with in the introduction to the section.

As a specimen of the illustrations of bird-life given in this volume we are permitted to reproduce the figure of the Pigmy Parrot of New Guinea (*Nasiterna pygmæa*), and we have selected this not only on account of the excellence of the tone, but because the bird has been drawn life-size, the total length being about three inches, which for a Parrot is, of course, remarkable.

The last of our illustrations, the Passenger Pigeon (*Columba migratoria*), has been chosen as a very pleasing example of Mr. George Lodge's engraving, and as representing one of the rarest of North American wanderers to the British Islands. Mr. Lodge is one of the very few artists who can engrave his own blocks, and who, knowing exactly the effect which is required to be produced, runs no risk of misinterpretation by entrusting the block to other hands. In the Pigeon here figured we have an excellent contrast between the soft delicate plumage of the bird and the rugged bark of the pine tree on which it is well posed.

THE PIGMY PARROT, *Nasiterna pygmæa.*

With this observation we must bring our notice to a close. So far as the work has proceeded it reflects the greatest credit on the industry of the author and the enterprise of the publishers.

The more we have looked into the work the more we have marvelled at the price at which it is being issued. Seeing that each part contains about one hundred pages of letterpress, well printed, and on good paper, fifty or sixty engravings, and two coloured plates, we should consider it cheap at five shillings a part, whereas the actual cost of each number is one shilling net.

The Passenger Pigeon, *Columba migratoria.*

It ought to have an enormous circulation, and, as an aid to the diffusion of zoological knowledge, we hope it may.

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